

Water Quality Distance Education Program for County Extension Agents^{1, 2}

KAREN M. MANCL, Department of Food, Agricultural, and Biological Engineering, The Ohio State University, Columbus, OH 43210

ABSTRACT. Few educational opportunities exist to teach rural homeowners water supply management. A correspondence program entitled "Quality Water for Home and Farm" was designed to prepare a group of teachers to fill the gap. The program objective was to train county extension agents in water quality and management principles and how to use educational materials to teach farmers and homeowners those principles through a distance education training program. Twenty six of the 72 county and district extension agents (36%) who enrolled completed the correspondence program. Participants gained increased understanding of water quality principles in 20 major areas.

OHIO J. SCI. 96 (4/5): 89-92, 1996

INTRODUCTION

For decades, the Cooperative Extension System has conducted outreach educational programs for US citizens as a part of the land grant university system. Rural residents often perceive the county extension agent as the most familiar member of the Extension System. With offices in nearly every county in the country, extension agents have traditionally conducted educational programs for adults and youth in topics related to agriculture, home, and family. In the 1980s Cooperative Extension began a new national water quality initiative (Bergsrud et al. 1990). More than 95 percent of the nation's rural residents depend on groundwater as the major source of water supply. Teaching rural Americans about water quality issues presents both a challenge and an opportunity for extension.

A national assessment of water quality training needs for extension staff identified drinking water as a nationwide concern (Bergsrud et al. 1990). According to the study, many county agents were concerned with the health risks of drinking water contaminants and the effectiveness of water treatment devices. But, as the assessment showed, most county agents felt ill-equipped to conduct proactive educational programs in drinking water quality.

PROGRAM OBJECTIVES

In Ohio, over 750,000 households (19%) rely on private individual water supplies (U.S. Department of Commerce 1983). In these private water supplies the homeowner or farmer is responsible for providing high quality water for their family and livestock. Unfortunately, few educational opportunities exist to teach farmers and rural homeowners effective water supply management.

The objectives of this project were to use a distance education training program to teach county extension agents (1) water quality and supply management principles and (2) how to use educational materials to teach

water supply management to others. The expectation was that, once trained, extension agents would begin to reach out to the hundreds of thousands of Ohioans who might benefit from education in water supply management.

CORRESPONDENCE TEACHING METHODS

Extension specialists employ several inservice training methods to prepare county agents to teach technical topics to the residents of their counties. Inservice training meetings lasting one to two days are common. Correspondence training programs are seldom used. Brophy and Dudley (1982) point out that training through correspondence can bring training to large numbers of teachers where they live and does not discriminate against those living in remote or rural areas. Correspondence training is not a new concept and is well suited as an aid to the understanding and teaching of a new topic area. Structured correspondence units can bring valuable reference materials to teachers working in areas where access to libraries is limited. MacKenzie et al. (1968) note that occupational conflicts and geographical separation may make it difficult for people to participate in resident instructional programs. Brophy and Dudley (1982) go on to note that correspondence training of teachers can be less expensive than resident programs.

Correspondence programs may take one of four formats (Erdos 1967):

1. Written correspondence only.
2. Written correspondence combined with technology (such as audio tape, video tape, radio, or television).
3. Written correspondence combined with individual tutoring.
4. Written correspondence combined with group meetings.

An extension home study course on estate planning (Goetting 1981) found that respondents preferred a combination of study-at-home and group meetings to study-at-home only. The meetings provided the opportunity for the participants to ask questions. In Goetting's ten-lesson course, most of the respondents preferred receiving their lessons once a week over all other possible schedules combined.

¹Manuscript received 15 May 1996 and in revised form 30 September 1996 (#96-12).

²Salaries and research support provided by state and federal funds appropriated to the Ohio Agricultural Research and Development Center, The Ohio State University, Approved as Journal No. 171-93.

MacKenzie et al. (1968) defined three types of participants in correspondence programs as graduates, dropouts, and nonstarts. A nonstart is a student who registers for a course of study, pays tuition, receives lesson material, but never turns in an assignment. A dropout submits one or more assignments but discontinues the course before completion. A graduate completes all or an acceptable portion of the course material. Studies of correspondence programs show nonstart and dropout rates are often high, ranging from 0 to 60 percent for nonstarts, and 27 to 90 percent for dropouts (MacKenzie et al. 1968).

MacKenzie et al. (1968) attribute the high dropout rates to two major causes. First, dropouts tend to have differing expectations and needs. Second, most dropouts tend to meet their personal goals before they complete the course. Letters to delinquent students are often used to encourage them to continue with the course. Other incentives for students to continue participation are the posting of graduation lists or the presentation of certificates or diplomas to course graduates.

The program evaluated in this research was a correspondence training course entitled "Quality Water for Home and Farm" developed for county extension agents. The program began with a one-day meeting followed by seven monthly written lessons. The program concluded with another one-day meeting. The one lesson-per-month format was selected to allow agents to complete the assignments as a part of their regular work schedule.

The program followed a simple model for identifying water quality problems and potential solutions.

- Step 1: Identify the beneficial uses of water (such as for drinking water, livestock water, irrigation, recreation).
- Step 2: Test the water to insure that it is of sufficient quality for the beneficial use.
- Step 3: If water quality problems are identified, examine correction options in four categories to determine which is most affordable and appropriate. The categories are:
 - 1. Protect the supply from the contaminant;
 - 2. Find and eliminate the contaminant source;
 - 3. Treat the water to remove the contaminant;
 - 4. Find and develop a new water supply.

Steps 1 and 2 on water testing were presented to participants in the initial six-hour meeting. The first correspondence lesson also covered water testing. The six remaining correspondence lessons addressed each of the options for solving water quality problems. Water treatment was divided into three lessons; disinfection, treatment of nuisance waters, and removal of toxins. The final lesson and final meeting covered the development of new water supplies. Each written lesson contained reading material, references, teaching material, questions, calculations, and exercises.

Agents taking the water quality correspondence training were required to return assignments each month to

remain enrolled in the program. Letters of encouragement were sent to delinquents. At the end of the program, extension agents who completed the program received certificates. A list of graduates was distributed to extension administrators, faculty, and staff.

EVALUATION METHODS

The participants were tested to evaluate the extent of learning. Simple tests were constructed of true/false, multiple choice, and fill-in-the-blank questions to address the important aspects of the program using methods described by Ary et al. (1990). A written pretest was administered at the beginning of the first meeting. A post test of similar but different questions was administered at the end of the closing meeting. The purpose of the pretest was to measure the previous knowledge of the participants. As Ary et al. (1990) have pointed out, the use of pretests in this type of one-group pre/post test design does have an effect on the test outcome. Participants may learn subject matter from the pretest, become familiar with the testing approach and therefore be less anxious when taking the post test. The pretest highlights the most important aspects of the program and participants may begin looking for the answers. In this application, the pretest also becomes a teaching tool.

The post tests were used to measure the increased knowledge and skills of the participants following the inservice. The post tests also served to reinforce the most important aspects of the training and helped illustrate to the participants and instructor where additional study may be required.

An additional advantage is that pre/post tests are easy to incorporate into a program and take only a few minutes to conduct. Because they do not require mailings or phone calls, valuable evaluation information can be collected with little expense and a high response rate.

Acquisition of new skills was evaluated using practicum exercises and demonstrations. Following instruction in how to interpret a test report each participant was given a water test report and asked to write their interpretation. After being taught how to collect a water sample, five agents were selected at random and asked to collect a water sample for the instructor.

The teaching activity of the agents was measured through their monthly assignment reports. An annual follow-up survey of program graduates documented their level of agent-led instruction, use of prepared teaching materials, and plans for future programming following the course. Follow-up studies are frequently used to evaluate the success of an educational program by assessing the skills and activities of the participants after the program is completed (Ary et al. 1990).

RESULTS

The correspondence program was offered from 1989 through 1991. Of the 72 agents who enrolled in the program, 26 (36%) graduated. Twenty-five (35%) were non-starts and 21 (29%) agents dropped out of the program before completion. These percentages fall within the expected ranges identified by MacKenzie et al. (1968).

A pre/post test measured agent knowledge of water

quality and management principles in 20 areas (Fig. 1). Both pre and post tests were completed by 15 of the graduates. Two of the graduates registered late and did not take the pretest. Seven of the graduates took the pretest, completed all of the assignments but did not complete the post test. County extension agents were considered to have previous knowledge of specific water supply management topics if they correctly answered questions about the topic on the pretest. An incorrect answer on the pretest and a correct answer on the post test was considered to be a topic learned as a result of the inservice.

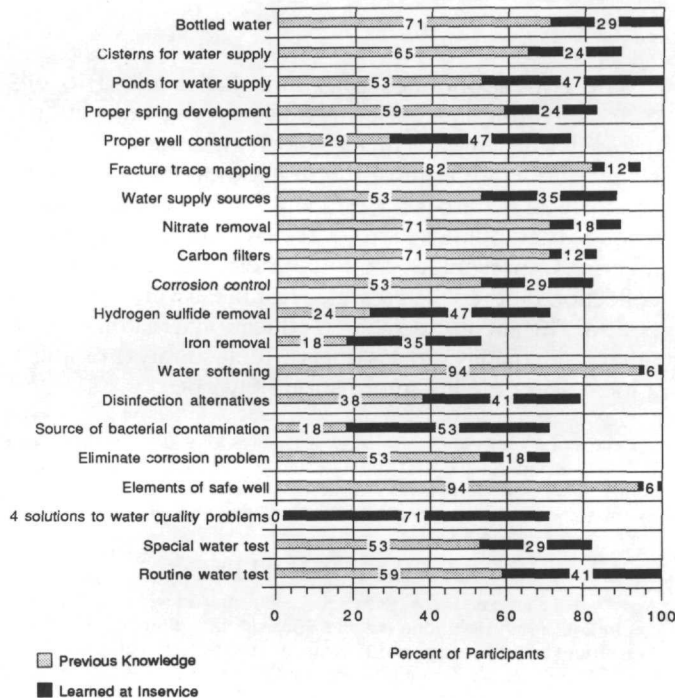


FIGURE 1. Pre/post test results for 16 graduates.

In three areas 80% of the 15 agents responded correctly to the pretest questions illustrating most agents had previous knowledge of the topic. Agents showed previous knowledge of the elements of a safe well, that fracture trace mapping is a technique for "finding" water, and what water softeners will and will not remove. In six areas fewer than 50% answered correctly on the pretest indicating an important area to cover in the training. None of the agents could list all 4 solutions to a water quality problem on the pretest. Agents showed limited previous knowledge in source of bacterial problems, disinfection, iron removal, hydrogen sulfide removal, and proper well construction techniques.

Following the training at least 80% of the 15 agents responded correctly on the post test in 13 areas, showing most trained agents had an understanding of those topics. At least 30% of the graduates learned about nine areas while participating in the program. In every area at least 50% of the graduates responded correctly on either test. Only 53% of the agents responded correctly to questions on water treatment techniques for iron removal.

Three important skills were measured using practicum exercises and demonstrations at the end of the initial meeting. Ninety-eight percent of the graduates were able to interpret a routine test report; 80% of the graduates were able to select the appropriate bottle for a water sample; and 80% of the graduates could correctly collect a water sample following the training.

The correspondence program was designed to encourage agents to use educational materials to teach water quality and management principles in their counties. Four areas of activity were delineated. First, each agent was provided with news items on five different topics and was encouraged to incorporate them into their regular news columns, newsletters, and radio programs. The results show 92% used information on water testing in local news outlets (Fig. 2).

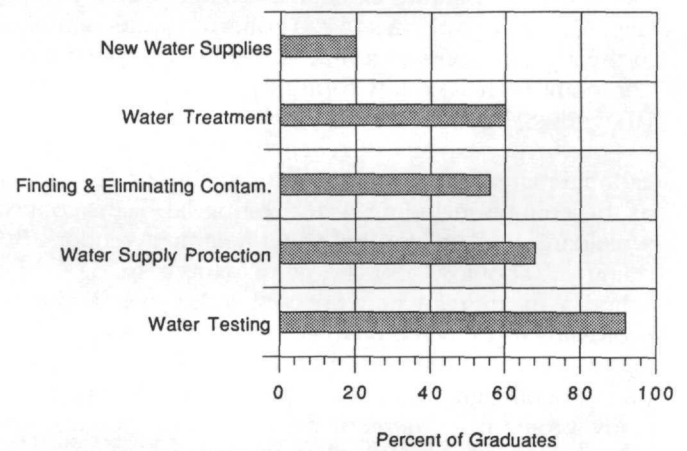


FIGURE 2. Use of news releases by course graduates in a one year period.

Second, county extension meetings were conducted by graduates using slide sets or a video. Agents were given slide sets on water testing, bacteria in drinking water, and nitrate in drinking water, and a video on rural water supplies along with training in how to present the materials. The results show 52% of the graduates conducted meetings in water testing (Fig. 3).

Third, water testing exhibits were developed and

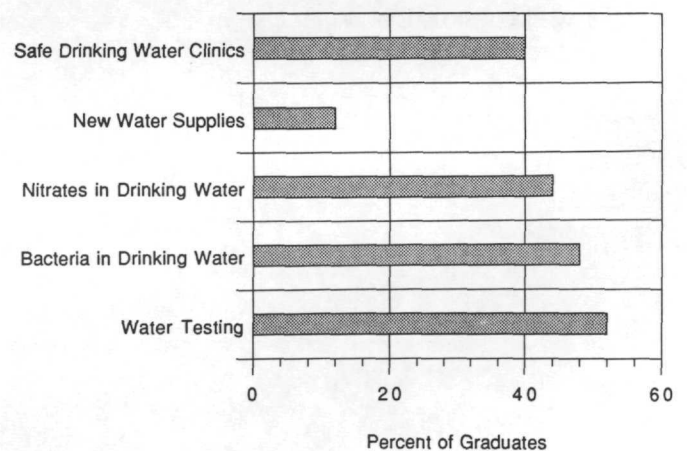


FIGURE 3. Meetings conducted by course graduates in a one year period.

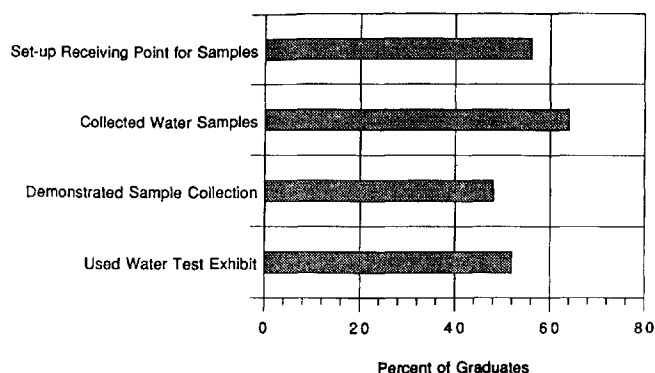


FIGURE 4. Water sampling and testing activities conducted by course graduates in a one year period.

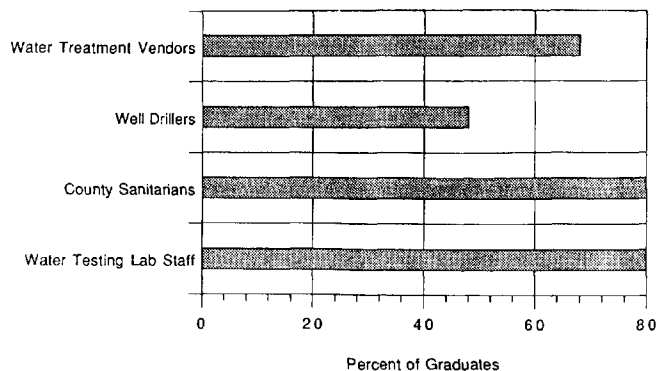


FIGURE 5. Course graduates that shared educational materials with other professionals.

made available for agent use. The analysis shows 52% of the graduates used the exhibits at events in their county (Fig. 4). Many graduates (64%) collected water samples in their county, 56% established a water sample collection point in their county for transport to a water testing lab, and 48% demonstrated sample collection.

Fourth, participants were encouraged to share educational materials with other water quality professionals in the county, including water testing lab staff, county sanitarians, well drillers, and water treatment vendors. By doing so, about 80% of the participants (Fig. 5) established a meaningful network with other water quality professionals in the county.

As a result of the correspondence training program, one program graduate developed a four-lesson home study program for homeowners. Another graduate received a grant from Ohio State University Extension to develop a countywide water testing program.

CONCLUSIONS

The overall results indicate that the Quality Water for Home and Farm correspondence program met the objective set for the program and was an effective method to deliver water quality and management training. Pretest and post test results show participants increased their understanding of water quality and management principles in 20 major areas. However, additional training may be needed in disinfection alternatives, iron and hydrogen sulfide removal, and proper well construction.

The correspondence program also worked to encourage county extension agents to use educational materials to teach water quality and management principles in their county. Of all of the items they received, most agents used materials on, and taught principles of, water testing. They published in local news outlets, conducted meetings, presented exhibits, demonstrated sample collection, and collected water samples over a one year period. The agents also shared educational materials with other water quality professionals in their county to establish a local water quality information network.

ACKNOWLEDGEMENTS. Support for this program is provided by Ohio State University Extension and the Ohio Agricultural Research and Development Center. Additional support was provided by US Department of Agriculture, Extension Service, under Special Project Number 89-EWQI-1-9131.

LITERATURE CITED

- Ary, D., L. C. Jacobs, and A. Razavieh 1990 Introduction to Research in Education. Holt, Rinehart and Winston, Inc., Fort Worth, TX.
- Bergsrud, F., M. A. Casey, and R. Kruege 1990 National Assessment of Water Quality Training Needs for Cooperative Extension System Staff. Minnesota Extension Service, Univ. of Minnesota, St. Paul.
- Brophy, M. and B. Dudley 1982 Patterns of distance teaching in teacher education. *J. of Education for Teaching*. 8(2): 166-162.
- Erdos, R. F. 1967 Teaching by Correspondence. Longmans, Green & Co. Limited, London.
- Goetting, M. A. 1981 Home study courses: An educational option. *J. of Extension*. 19(6): 14-18.
- MacKenzie, O., E. L. Christensen, and P. H. Rigby 1968 Correspondence Instruction in the United States. McGraw-Hill Book Co., New York.
- U.S. Department of Commerce 1983 Census of Population and Housing: 1980. Supplementary Report: Advance Estimates of Social, Economic, and Housing Characteristics. Part 37 - Ohio PHC80-S2-37 Counties and Selected Places. Bureau of Census, Washington, DC.